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MFN 09-544

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Subject: **Response to Portion of NRC RAI Letter No. 328 Related to ESBWR Design Certification Application – DCD Tier 2 Section 3.8 – Seismic Category I Structures; RAI Number 3.8-125 S01**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to a portion of the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) letter number 328 sent by NRC letter dated April 16, 2009 (Reference 1). RAI Number 3.8-125 S01 is addressed in Enclosure 1. Enclosure 2 contains the DCD changes to Tier 1 and Tier 2 as a result of GEH's response to this RAI. Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box.

If you have any questions or require additional information, please contact me.

Sincerely,

Richard E. Kingston

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Vice President, ESBWR Licensing

Reference:

1. MFN 09-273 Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, GEH, *Request For Additional Information Letter No. 328 Related to ESBWR Design Certification* dated April 16, 2009

Enclosure:

1. Response to Portion of NRC RAI Letter No. 328 Related to ESBWR Design Certification Application - DCD Tier 2 Section 3.8 – Seismic Category I Structures; RAI Number 3.8-125 S01
2. Response to Portion of NRC RAI Letter No. 328 Related to ESBWR Design Certification Application – DCD Tier1 and Tier 2 DCD Markups for RAI Number 3.8-125 S01

cc:	AE Cubbage	USNRC (with enclosures)
	JG Head	GEH/Wilmington (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	eDRF Section	0000-0104-2053 (RAI 3.8-125 S01)

ENCLOSURE 1

MFN 09-544

Response to NRC RAI Letter No. 328
Related to ESBWR Design Certification Application

DCD Tier 2 Section 3.8 – Seismic Category I Structures

RAI Number 3.8-125 S01

[1] Original Response previously submitted under MFN 09-183 is included to provide historical continuity during review.

NRC RAI 3.8-125

GEH letter MFN 08-932, dated December 2, 2008, submitted Licensing Topical Report NEDC-33373P, Revision 1, "Dynamic, Load-Drop and Thermal-Hydraulic Analysis for ESBWR Fuel Racks." This report presents the structural analysis of the Spent Fuel High Density Fuel Storage Racks (FSR) for the spent fuel storage pool located in the fuel building. The report indicates that the design of the FSR has been revised such that they are no longer anchored to the pool floor. The FSR are evaluated as free-standing racks on the pool floor. While the report evaluates the adequacy of the FSR and provides some information about the loads on the spent fuel pool structure, it does not appear to contain information regarding how these loads are used for the design of the spent fuel pool structure. Therefore, GEH is requested to provide a description of the evaluation of the pool structure (reinforced concrete floor and walls, and steel liner) resulting from all loads generated by the new analyses for the FSR.

GEH Response

The structural evaluation of the spent fuel pool structure for these localized loads generated from the FSR will be performed in the detail design phase to meet the requirements stipulated in DCD Tier 1 Subsection 2.16.7 and DCD Tier 2 Subsection 3.8.4.3.3.

DCD Impact

Markups of DCD Tier 1 Subsection 2.16.7, DCD Tier 1 Table 2.16.7-2, and DCD Tier 2 Subsection 3.8.4.3.3 were provided to the NRC in MFN 09-183, dated 3/17/09.

NRC RAI 3.8-125, Supplement 1

The staff reviewed GEH response transmitted in GEH letter MFN 09-183, dated March 17, 2009. Even though the response indicates that the evaluation of the spent fuel pool structure will be performed in the detail design phase, the staff still maintains that some assessment needs to be performed at this time during the design certification phase to demonstrate that the current design of the spent fuel pool structure is adequate to withstand the expected loads from the new free-standing fuel storage racks. The evaluation to be performed at this time should consider the effects of the revised spent fuel racks on the seismic analysis of the pool structure and fuel building, and the effects on the design of the pool structure. In addition, the potential localized impact loads on the pool concrete walls and floors, and the liner should be assessed. Therefore, the staff again requests GEH to perform a quantitative evaluation to demonstrate that the spent fuel pool structure is adequate to withstand loads from the new freestanding fuel storage racks.

GEH Response

An assessment of the potential localized impact loads on the spent fuel pool concrete walls and wall liner has been made, and the updated structural analysis for the new free-standing spent fuel storage racks demonstrates that the racks do not impose impact loads on the pool walls. To ensure sufficient gaps between the spent fuel pool walls and the free-standing spent fuel storage racks in the as-built condition, the tolerance of the reference dimensions X1 and X3 in DCD Tier 1 Table 2.16.7-1 will be changed from ±300 mm to +300,-200 mm in Revision 6. This DCD Tier 1 information will also be included in DCD Tier 2 Revision 6 as Table 3G.6-3.

Since the free-standing spent fuel storage racks do not interact with the spent fuel pool walls under the SSE, the only dynamic interaction with the spent fuel pool structure is at the base slab. The fully loaded spent fuel storage rack masses have been included as lumped mass to the base slab that is an integral part of the fuel building basemat. Therefore, the new free-standing spent fuel storage racks have no effect on the seismic analysis of the spent fuel pool structure and fuel building.

At the locations of the spent fuel storage rack support legs, embedded plates will be provided to carry the rack support reaction loads to the fuel building concrete mat foundation. The spent fuel pool concrete floor is a 5.5 m thick mat foundation and is adequate to withstand loads from the new free-standing spent fuel storage rack support leg embedded plates.

DCD/LTR NEDC-33373P Impact

DCD Tier 1 Table 2.16.7-1 and DCD Tier 2 Subsection 3G will be revised in Revision 6 as noted in the attached markups.

DCD Tier 2 Table 3G.6-3 will be added in Revision 6 as noted in the attached markups.

LTR NEDC-33373P will be revised in Revision 2 to include the updated structural analysis for the new free-standing spent fuel storage racks.

ENCLOSURE 2

MFN 09-544

Response to NRC RAI Letter No. 328
Related to ESBWR Design Certification Application

DCD Tier 1 and Tier 2 Markups

for RAI Number 3.8-125 S01

Table 2.16.7-1

Critical Dimensions of Fuel Building – Part 2

Key Dimension	Reference Dimension	Nominal Dimension* ~~(mm)~~ (ft-in)	Tolerance* ~~(mm)~~ (in)
Distance from Outside Surface of Wall at Column Line FA to Column Line FC when Measured at Column Line F1	X1 (Figure 2.16.7-1)	21700 (71'-2⅜")	+300,-200 (+12",-7⅞") ~~+/- 300~~
Distance from Outside Surface of Wall at Column Line FF to Column Line FC when Measured at Column Line F1	X2 (Figure 2.16.7-1)	27300 (89'-6¾")	± ~~+/-~~ 300 (±12")
Distance between Outside Surface of Walls at Column Lines R7 and F3 when Measured at Column Line FA	X3 (Figure 2.16.7-1)	21000 (68'-10¾")	+300,-200 ~~+/- 300~~ (+12",-7⅞")
Distance from Top of Basemat to Design Plant Grade (Basemat excluding Spent Fuel Pool, Cask Pit, and Incline Fuel Transfer Tube Pit)	X4 (Figure 2.16.7-6)	16150 (52'-11⅞")	± ~~+/-~~ 300 (±12")
Deleted			
Distance from Design Plant Grade to Top Surface of Roof (Excluding C-II Portion)	X5(Figure 2.16.7-6)	17850 (58'-6¾")	± ~~+/-~~ 300 (±12")

*SI units are the controlling units and English units are for reference only.

3G. DESIGN DETAILS AND EVALUATION RESULTS OF SEISMIC CATEGORY I STRUCTURES

Text sections, Tables and Figures (all of 3G) that are bracketed and italicized with an asterisk following the brackets are designated as Tier 2. Prior NRC approval is required to change. One bracket shall be added at the very beginning of the Appendix and one bracket at the end of the last page of that Appendix followed by an *.

Note: Tables and figures that are computer analysis outputs cannot be italicized. These tables and figures shall be considered as being designated as Tier 2*.

[*This appendix presents the structural design and analysis for the Reactor Building (RB), Control Building (CB), Fuel Building (FB) and Firewater Service Complex (FWSC) of the ESBWR Standard Plant. It addresses all applicable items included in Appendix C to United States Nuclear Regulatory Commision (NRC) Standard Review Plan, NUREG-0800, Subsection 3.8.4. Drawings depicted in the Design Control Document (DCD) are not used for construction. Construction drawings meet the technical licensing commitments made in the DCD but are issued under different contractual/industrial rules than the DCD drawings and reflect detailed design configuration. The final design details~~, and hence final component stresses may be different from those reported here but they~~ will meet the structural acceptance criteria presented in Section 3.8 and in ~~accordance with~~ Tier 1 ITAACs in Tables 2.16.5-2, 2.16.6-2, and 2.16.7-2. The critical dimensions and acceptable tolerances are presented in Section 3G.6.*

3G.1 *REACTOR BUILDING*

The RB encloses the concrete containment and its internal systems, structures, and components. Located above the concrete containment in the RB are the Isolation Condenser/Passive Containment Cooling System (IC/PCCS) pools (including expansion pools), the buffer pool, which is also used to store the dryer, and the equipment storage pool, which is also used to store the chimney partitions and the separator.

3G.1.1 *Objective and Scope*

The objective of this subsection is to document the structural design details, inputs and analytical results from the analysis of the ESBWR main building structures encased in the RB. The scope includes the design and analysis of the structure for normal, severe environmental, extreme environmental, and abnormal loads.

3G.1.2 *Conclusions*

The following are the major summary conclusions on the design and analysis of the RB, the concrete containment and the containment internal structures.

- *Based on the results of finite element analyses performed in accordance with the design conditions identified in Subsections 3G.1.3 and 3G.1.5, stresses and/or strains in concrete, reinforcement, liner and containment internal structures are less than the*

Table 3G.6-3

Critical Dimensions of Fuel Building – Part 2

Key Dimension	Reference Dimension	Nominal Dimension* mm (ft-in)	Tolerance* mm (in)
Distance from Outside Surface of Wall at Column Line FA to Column Line FC when Measured at Column Line F1	X1 (Figure 3G.6-17)	21700 (71'-2⅜")	+300,-200 (+12",-7⅞")
Distance from Outside Surface of Wall at Column Line FF to Column Line FC when Measured at Column Line F1	X2 (Figure 3G.6-17)	27300 (89'-6¾")	±300 (±12")
Distance between Outside Surface of Walls at Column Lines R7 and F3 when Measured at Column Line FA	X3 (Figure 3G.6-17)	21000 (68'-10¾")	+300,-200 (+12",-7⅞")
Distance from Top of Basemat to Design Plant Grade (Basemat excluding Spent Fuel Pool, Cask Pit, and Incline Fuel Transfer Tube Pit)	X4 (Figure 3G.6-22)	16150 (52'-11⅞")	±300 (±12")
Distance from Design Plant Grade to Top Surface of Roof (Excluding C-II Portion)	X5 (Figure 3G.6-22)	17850 (58'-6¾")	±300 (±12")

* SI units are the controlling units and English units are for reference only.